



# Engineering Aid 3

Only one answer sheet is included in the NRTC. Reproduce the required number of sheets you need or get answer sheets from your ESO or designated officer.

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# ENGINEERING AID 3

NAVEDTRA 80696-A

Prepared by the Naval Education and Training Program Management  
Support Activity, Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the good work.

## HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA : If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the Training Manual (TRAMAN) or assignments in any other way.

TEXTBOOK ASSIGNMENTS: The TRAMAN for this course is ENGINEERING AID Basic, NAVEDTRA 10696-A. The TRAMAN pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

BLACK DOT INFORMATION: Black dots (●) may be used in the text and correspondence course to emphasize important or supplemental information and to highlight instructions for answering certain questions. Read these black dot entries carefully; they will help you answer the questions and understand the material.

SELECTING YOUR ANSWERS: After studying the TRAMAN, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the TRAMAN. You may refer freely to the TRAMAN and seek advice and information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

## SUBMITTING COMPLETED ANSWER SHEETS:

Complete all assignments as quickly as possible to derive maximum benefit from the course. As a minimum, you must submit at least one assignment per month. This is a requirement established by the Chief of Naval Education and Training. Failure to meet this requirement could result in disenrollment from the course.

TYPES OF ANSWER SHEETS: If you are a U.S. Navy enlisted member on active duty or a drilling U.S. Naval Reserve enlisted member, you should use the answer sheet attached at the end of this course and follow the instructions in section A below. If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, you should use the Automatic Data Processing (ADP) answer sheets included in the course package and follow the instructions in section B.

### A. Manually Scored Answer Sheets

If you are a U.S. Navy enlisted member on active duty or attached to a U.S. Naval Reserve drilling unit, your course will be administered by your local command. You must use the answer sheet designed for manual scoring, NETPMSA form 1430/5, Stock Ordering Number 0502-LP-216-0100. You may get a supply of the forms from your ESO or you may reproduce the one in the back of this course booklet. DO NOT USE THIS FORM FOR COURSES ADMINISTERED BY NETPMSA.

### Recording Information on the Manually Scored Answer Sheets:

As you complete each assignment, submit the completed answer sheet to your local educational services officer (ESO) for grading. You may submit more than one answer sheet at a time. Remember, you must submit at least one assignment each month.

Grading: Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each

assignment is 3.2. If you receive less than 3.2 on any assignment, the ESO will list the questions you answered incorrectly and give you a pink answer sheet marked RESUBMIT. You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry on page 4 of your service record.

Student Questions: If you have questions concerning the administration of this course, consult your local ESO.

#### B. ADP Answer Sheets

If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling reserve unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, you should use the ADP answer sheets provided in your course package. You should use one blank original ADP answer sheet for each assignment. Use only the original ADP answer sheet provided in your course package, NETPMSA will not accept reproductions.

Recording Information on the ADP Answer Sheets: Carefully follow the MARKING INSTRUCTIONS on each answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information identifies you (the student), the course, and the assignment; it must be correct for NETPMSA to process your course and give you credit for your work.

Because your ADP answer sheets will not be returned to you, be sure to mark your answers in the course booklet as you are working the course. Whenever you complete an assignment, transfer your answers from the course booklet to the ADP answer sheet.

Mailing the Completed ADP Answer Sheets: Upon completing an assignment, mail the completed answer sheet to:

Commanding Officer  
NETPMSA 074  
6490 Saufley Field Rd  
Pensacola, FL 32559-5000

Use envelopes to mail your answer sheets. You must provide your own envelopes or request them from your local educational services officer (ESO). You may enclose more than one answer sheet in a single envelope. Remember, regardless of how many answer sheets you submit at a time, NETPMSA should receive at least one assignment a month.

NOTE: DO NOT USE THE COURSE COMMENTS PAGE AS AN ENVELOPE FOR RETURNING ANSWER SHEETS OR OTHER COURSE MATERIALS.

Grading: NETPMSA will grade the answer sheets and notify you by letter concerning your grade for each assignment, your incorrect answers, and your final grade. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, you must rework the assignment. NETPMSA will enclose a new ADP answer sheet in the letter notifying you of the questions you answered incorrectly. You will be required to redo the assignment and resubmit the new answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: When you complete the last assignment, fill out the Course Completion form in the back of the course and enclose it with your last answer sheet. NETPMSA will issue you a letter certifying that you satisfactorily completed the course. You should make sure that credit for the course is recorded in your service record.

NOTE : YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH NETPMSA'S ADP SYSTEM-- NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. This is especially important if you are taking the course for Naval Reserve retirement credit. You must mail your answer sheets at least 60 days before your anniversary date. This will provide you with enough time for delays in the mail or reworking failed assignments. DO NOT MAIL YOUR ASSIGNMENTS TO THE NAVAL RESERVE PERSONNEL COMMAND (NRPC).

Student Questions: If you have questions concerning this course, notify NETPMSA by mail (use the address on page ii) or by telephone: AUTOVON 922-1366 or commercial (904) 452-1366.

#### NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For the purpose of Naval Reserve retirement, this edition of the course is evaluated at 20 points. These points will be credited to you upon your satisfactory completion of the entire course.

UNIT	ASSIGNMENTS	POINTS
1	1 - 8	12
2	9 - 13	8

NOTE : YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH NETPMSA'S ADP SYSTEM--

NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. Refer to the Course Completion paragraph under section B. ADP Answer Sheets .

#### COURSE OBJECTIVES

In completing this Nonresident Training Course (NRTC), you will demonstrate a knowledge of the subject matter by correctly answering questions on the following topics: Mathematics and Units of Measurement; Drafting Equipment; Drafting: Fundamentals and Techniques; Drafting: Geometric Construction; Drafting: Projections and Sketching; Reproduction Process; Wood and Light Frame Structures; Concrete and Masonry; Mechanical Systems and Plan; Electrical Systems and Plan; Construction Drawings; Elements of Surveying and Surveying Equipment; Direct Linear Measurements and Field Survey Safety; Horizontal Control; Direct Leveling and Basic Engineering Surveys; Materials Testing: Soil and Concrete; and Administration.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. The student can readily identify the type of each question, and the action required, by inspection of the samples given below.

#### MULTIPLE-CHOICE QUESTIONS

Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

##### SAMPLE

- s-1. Who was the first person appointed Secretary of Defense under the National Security Act of 1947?

Indicate in this way on the answer sheet:

1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

	1	2	3	4
	T	F		
s-1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

#### TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

##### SAMPLE

- s-2. All naval officers are authorized to correspond officially with any systems command of the Department of the Navy without their respective commanding officer's endorsement.

Indicate in this way on the answer sheet:

1. True
2. False

	1	2	3	4
	T	F		
s-2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

#### MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

##### SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions. Some responses may be used once, more than once, or not at all.

##### A. OFFICER

##### B. DEPARTMENT

Indicate in this way on the answer sheet:

- |                               |                           |
|-------------------------------|---------------------------|
| s-3. Damage Control Assistant | 1. Operations Department  |
| s-4. CIC Officer              | 2. Engineering Department |
| s-5. Disbursing Officer       | 3. Supply Department      |
| s-6. Communications Officer   |                           |

	1	2	3	4
	T	F		
s-3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _
s-5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> _ _ _
s-6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _ _ _

# ASSIGNMENT 1

Textbook Assignment: "Mathematics and Units of Measurement." Pages 1-1 through 1-35.

- 
- 1-1. Which of the following mathematical branches deals, in part, with the theory of space and figures in space?
1. Arithmetic
  2. Trigonometry
  3. Geometry
  4. Algebra
- 1-2. Which, if any, of the following expressions is an irrational number?
1.  $\sqrt{2}$
  2.  $\sqrt{25/9}$
  3.  $5 \frac{2}{7}$
  4. None of the above
- 1-3. In fractions, the rule of ensuring that the denominators are alike applies to which of the following actions?
1. Multiplying fractions
  2. Subtracting fractions only
  3. Dividing fractions
  4. Both adding and subtracting fractions
- 1-4. Which of the following fractions is the equivalent of  $7/9$ ?
1.  $9/7$
  2.  $21/27$
  3.  $35/42$
  4.  $126/288$
- 1-5. What is the relationship between  $\sqrt{20}$  and  $2\sqrt{5}$ ?
1. They are rational numbers
  2. They are imaginary numbers
  3. They are equivalent
  4. They are reciprocals of each other
- 1-6. When is the exponent of a number NOT required to be written?
1. When the exponent has been reduced to its lowest term
  2. When the value of the exponent is 0
  3. When the number has been raised to its highest power and its value is 0
  4. When the value of the exponent is 1
- 1-7. When using the arithmetic extraction method, what is the first step you should take to determine the square root of a number?
1. Divide the number into two-digit groups working away from the decimal point in both directions
  2. Divide the number into single-digit groups to the left of the decimal point
  3. Divide the number into two-digit groups working only to the left of the decimal point
  4. Determine the square root of the first digit of the number
- 1-8. When using the arithmetic extraction method to determine the square root of 368.42, what is the divisor you should use to determine the third digit of the result?
1. 29
  2. 381
  3. 389
  4. 3829
- 1-9. Which of the following terms is the equivalent of  $\sqrt{16^3}$ ?
1.  $16^{-3}$
  2.  $16^{-1/3}$
  3.  $16^{2/3}$
  4.  $16^{3/2}$
- 1-10. Solve  $\sqrt{8 \frac{1}{2}}$ .
1. 2.0000
  2. 2.0615
  3. 2.8284
  4. 2.9155

1-11. To find the reciprocal of a fraction, you should take which of the following actions?

1. Divide the fraction by 1
2. Multiply the fraction by 1
3. Invert the fraction only
4. Invert the fraction and divide by 1

1-12. The use of a ratio would NOT be appropriate for which of the following comparisons?

1. Weight to volume of construction material
2. The rate a person reads to the rate that the average person reads
3. The acreage contained in one parcel of land to acreage contained in another
4. The weight of a construction material to the standard weight of a like material

1-13 Which of the following ratio? is expressed correctly in its final form?

1. 9.03 m/ 2.61 m
2. 2.5 ft : 17.5 ft
3. 9.03 : 2.61
4. 60 mi / 1 hr

1-14 Which of the following expressions represent(s) a correctly written proportion?

1. 3:9 / 11:33
2. 3:9 = 11:33
3. 3:9::33:11
4. Both 2 and 3 above

1-15. Which of the following equations is a linear equation?

1.  $4x^2 = 16$
2.  $y^2 + 16y = 0$
3.  $1/4x^2 + 16 = 1$
4.  $x/2 + 6x = 13$

- |   |
|---|
| <p>A. ALL SIDES ARE EQUAL</p> <p>B. OPPOSITE SIDES ARE PARALLEL</p> <p>C. ALL INTERIOR ANGLES ARE EQUAL</p> <p>D. ONLY TWO SIDES ARE PARALLEL</p> |
|---|

**Figure 1A**

IN ANSWERING QUESTIONS 1-16 THROUGH 1-18, SELECT THE CHARACTERISTIC FROM FIGURE 1A THAT APPLIES TO THE GEOMETRIC FIGURE LISTED.

1-16. Trapezoid.

1. A and B
2. B and C
3. C and D
4. D only

1-17. oblong.

1. A and B
2. B and C
3. C and D
4. D only

1-18. Rhombus.

1. A and B
2. B and C
3. C and D
4. D only

1-19. What is the total area of a rectangular parking lot that measures 310 ft by 784 ft?

1. 299,209 sq ft
2. 243,040 sq ft
3. 121,304 sq ft
4. 24,304 sq ft

1-20 What is the area of a right triangle if the sides adjacent to the right angle measure 5 and 8 feet long?

1. 13 sq ft
2. 20 sq ft
3. 26 sq ft
4. 40 sq ft

IN ANSWERING QUESTIONS 1-21 THROUGH 1-23, REFER TO FIGURES 1-8, 1-9, and 1-10 IN YOUR TEXT.

1-21. Assume that triangle ABC in Figure 1-8 has the following dimensions:

AC = 5 1/2 in  
AD = 4 1/2 in  
BD = 2 1/2 in  
CD = 3 in

What is the area of this triangle?

1. 5 1/2 sq in
2. 7 sq in
3. 10 sq in
4. 10 1/2 sq in



- 1-22. Assume that rhomboid ABCD in figure 1-9 has the following dimensions:

AD =  $7 \frac{1}{2}$  in  
CD =  $4 \frac{3}{4}$  in  
EC = 6 in  
AE =  $4 \frac{1}{2}$  in

What is the area of this rhomboid?

1. 27 sq in
2.  $30 \frac{1}{2}$  sq in
3.  $33 \frac{3}{4}$  sq in
4.  $37 \frac{1}{2}$  sq in

- 1-23. Assume that the trapezoid in figure 1-10 has the following dimensions:

AD = 5 in  
BC = 3 in  
CF = 3 in

What is the area of the trapezoid?

1. 8 sq in
2. 12 sq in
3. 16 sq in
4. 24 sq in

- 1-24. A circle with a diameter of 5 inches will have what area in square inches?

1. 12.6
2. 15.7
3. 19.6
4. 31.4

- 1-25. A circle with a circumference of 12 inches will have what area in square inches?

1. 11.46
2. 11.56
3. 12.45
4. 12.46

- 1-26. If the diameter of the circle in textbook figure 1-13 is 4 inches and the central angle of the sector portion is 60 degrees, what is the area of the sector?

1. 1.0944 sq in
2. 2.0944 sq in
3. 2.1416 sq in
4. 3.1416 sq in

- 1-27. What is the area of an equilateral octagon whose  $1 \frac{1}{2}$ -inch sides are tangent to an inscribed circle with a diameter of  $3 \frac{1}{2}$  inches?

1. 10 sq in
2.  $10 \frac{1}{4}$  sq in
3.  $10 \frac{1}{2}$  sq in
4.  $10 \frac{3}{4}$  sq in

- 1-28. What is the approximate area of an ellipse in which the major axis is 8 feet long and the minor axis is 4 feet long?

1. 12 Sq ft
2. 16 sq ft
3. 25 sq ft
4. 32 sq ft

- A.  $V = Bh$   
 B.  $V = 1/3\pi r^2 h$   
 C.  $V = 1/3\pi h (r_1^2 + r_1 r_2 + r_2^2)$   
 D.  $V = 4/3\pi r^3$

**Figure 1B**

IN ANSWERING QUESTIONS 1-29 THROUGH 1-34, SELECT THE FORMULA FROM FIGURE 1B THAT YOU SHOULD USE TO DETERMINE THE VOLUME OF THE GIVEN GEOMETRIC FIGURE.

1-29. Cylinder.

1. A
2. B
3. C
4. D

1-30. Frustum of a cone.

1. A
2. B
3. C
4. D

1-31. Cone.

1. A
2. B
3. C
4. D

1-32. Parallelepipeds.

1. A
2. B
3. C
4. D

1-33. Sphere.

1. A
2. B
3. C
4. D

1-34. Triangular prism.

1. A
2. B
3. C
4. D

1-35. What is the reciprocal function of  $\cos 25^\circ$ ?

1. Ccs  $25^\circ$
2. Cot  $25^\circ$
3. Sec  $25^\circ$
4. Sin  $25^\circ$

1-36. What function of the  $45^\circ$  angle in textbook figure 1-21 is represented by the line DB?

1. conversed sine
2. Cosine
3. cotangent
4. cosecant

1-37. What angle is the complement of  $75^\circ$ ?

1.  $15^\circ$
2.  $75^\circ$
3.  $90^\circ$
4.  $105^\circ$

1-38. When expressed as a function of another angle,  $\cos 40^\circ$  equals what value?

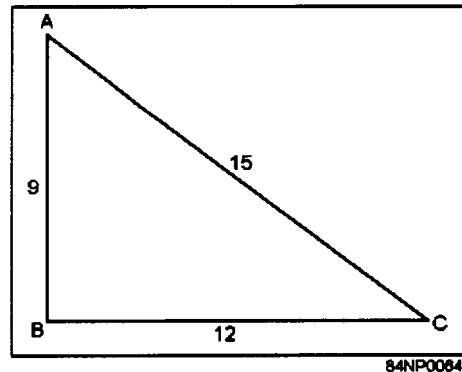
1. Sec  $140^\circ$
2. Sin  $140^\circ$
3. Sec  $50^\circ$
4. Sin  $50^\circ$

1-39. What angle is the supplement of  $145^\circ$ ?

1.  $10^\circ$
2.  $35^\circ$
3.  $45^\circ$
4.  $55^\circ$

1-40. The value of  $-\cos 118^\circ$  is equal to which of the following values?

1. Cos  $62^\circ$
2. Sin  $62^\circ$
3. Sin  $118^\circ$
4. Cos  $180^\circ$



84NP0064

**Figure 1C**

IN ANSWERING QUESTIONS 1-41 AND 1-42, REFER TO FIGURE 1C.

1-41. What is the cosine of angle A?

1. 0.60000
2. 0.75000
3. 0.80000
4. 1.33333

1-42. What is the tangent of angle C?

1. 0.60000
2. 0.75000
3. 0.80000
4. 1.44444

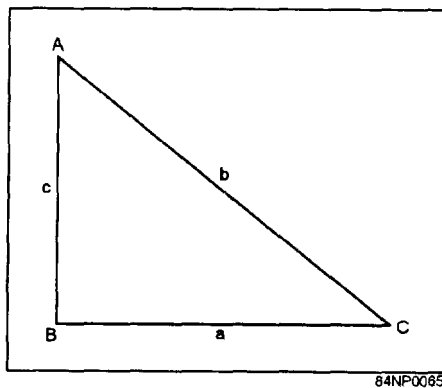


Figure 1D

IN ANSWERING QUESTIONS 1-43 THROUGH 1-45, REFER TO FIGURE 1D. SELECT THE TRIGONOMETRIC FUNCTION FROM THE FOLLOWING LIST THAT SHOULD BE USED FOR THE SITUATION DESCRIBED.

- |  |
|--|
| <p>A. SINE<br/>B. COSINE<br/>C. TANGENT<br/>D. COTANGENT</p> |
|--|

1-43. Determining the size of angle A if the lengths of sides a and b are known.

1. A
2. B
3. C
4. D

1-44. Determining the size of angle C if the lengths of sides a and b are known.

1. A
2. B
3. C
4. D

1-45. Determining the size of angle C if the lengths of sides b and c are known.

1. A
2. B
3. C
4. D

1-46. Which function of the ground-slope angle is the ratio of the horizontal distance to the slope distance?

1. Sine
2. Cosine
3. Tangent
4. Versed sine

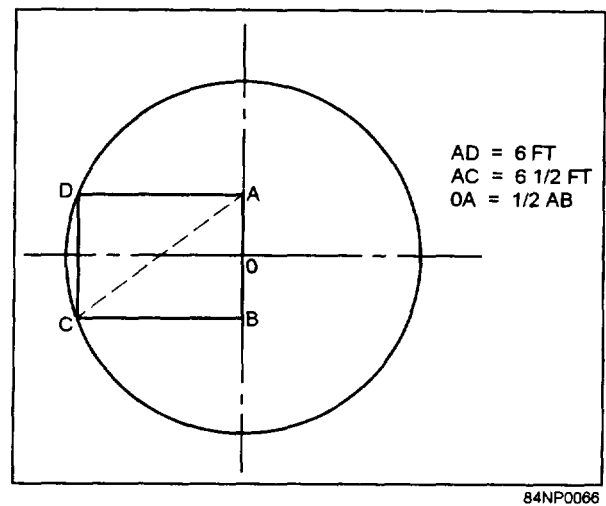


Figure 1E

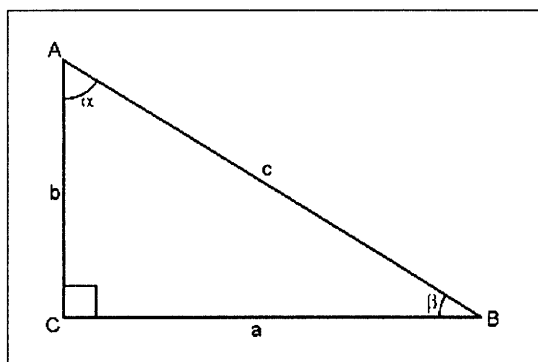
IN ANSWERING QUESTIONS 1-47 AND 1-48, REFER TO FIGURE 1E.

1-47. How many square feet are contained in rectangle ABCD?

1. 12.00
2. 15.00
3. 37.50
4. 53.08

1-48. How many square feet are contained within the circle?

1. 9.62
2. 10.20
3. 19.25
4. 118.00



84NP0067

**Figure 1F**

IN ANSWERING QUESTIONS 1-49 THROUGH 1-51, REFER TO FIGURE 1F AND TO THE TABLE OF TRIGONOMETRIC FUNCTIONS LOCATED IN APPENDIX III OF YOUR TEXT.

1-49. How many degrees are contained in angle  $\beta$  if angle  $\alpha = 55^\circ$ ?

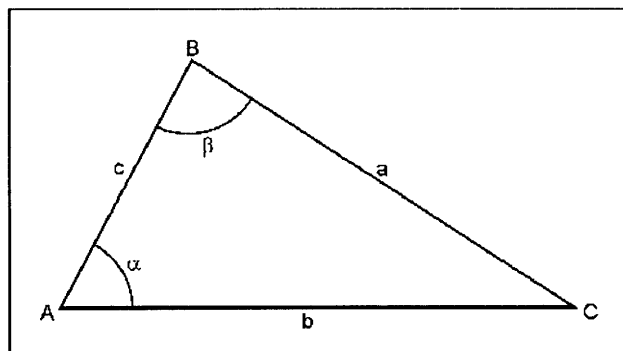
1.  $30^\circ$
2.  $35^\circ$
3.  $40^\circ$
4.  $45^\circ$

1-50. What is the length of side  $b$  if side  $a = 6$  feet and angle  $\beta = 30^\circ$ ?

1. 3.32 ft
2. 3.46 ft
3. 10.39 ft
4. 10.82 ft

1-51. What is the size of angle  $B$  if side  $b = 6$  feet and side  $c = 20$  feet?

1.  $16^\circ 42'$
2.  $17^\circ 00'$
3.  $17^\circ 28'$
4.  $17^\circ 30'$



84NP0068

**Figure 1G**

IN ANSWERING QUESTIONS 1-52 THROUGH 1-56, REFER TO FIGURE 1G.

1-52. When given angle  $\beta$  and sides  $b$  and  $c$ , what law should you use to solve for all unknowns?

1. Law of sines
2. Law of cosines
3. Law of tangents

1-53. When angle  $\alpha$  and sides  $b$  and  $c$  are known, what law should you use to determine side  $a$ ?

1. Law of sines
2. Law of cosines
3. Law of tangents

1-54. When angle  $\alpha$  and sides  $b$  and  $c$  are known, what law should you use to solve for all unknown angles?

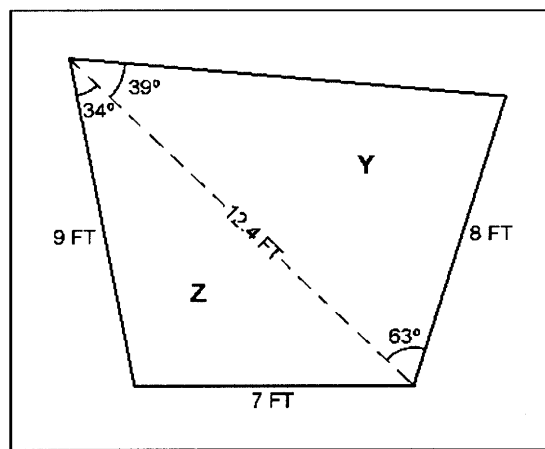
1. Law of sines
2. Law of cosines
3. Law of tangents

1-55. When side  $a$  and angles  $\alpha$  and  $\beta$  are known, what law should you use to solve for all unknowns?

1. Law of sines
2. Law of cosines
3. Law of tangents

1-56. When given sides  $a$ ,  $b$ , and  $c$ , what law should you use to solve for all unknown angles?

1. Law of sines
2. Law of cosines
3. Law of tangents



84NP0069

**Figure 1H**

IN ANSWERING QUESTIONS 1-57 AND 1-58, REFER TO FIGURE 1H.

- 1-57. The area of triangle Z is approximately equal to the square root of
1. 14
  2. 67
  3. 781
  4. 957
- 1-58. The area of triangle Y is equal to
1.  $49.6 \sin 63^\circ$
  2.  $49.6 \cos 63^\circ$
  3.  $99.2 \sin 39^\circ$
  4.  $99.2 \cos 39^\circ$
- 1-59. A distance of 1.25 statute miles is equivalent to how many (a) engineer's chains and (b) rods?
1. (a) 53 (b) 320
  2. (a) 66 (b) 400
  3. (a) 76 (b) 460
  4. (a) 100 (b) 400
- 1-60. A linear distance of 0.68 kilometers is approximately equivalent to how many (a) meters and (b) nautical miles?
1. (a) 68 (b) 23.7
  2. (a) 68 (b) 27.2
  3. (a) 680 (b) 2.4
  4. (a) 680 (b) 0.4
- 1-61. What is the area of a road 1,200 yards long and 22 feet wide?
1. 8,000 sq yd
  2. 8,600 sq yd
  3. 8,640 sq yd
  4. 8,800 sq yd
- 1-62. A total of how many cubic yards of concrete are required for a retaining wall footing that measures 50 feet long, 15 feet wide, and 5 feet high?
1. 128
  2. 130
  3. 136
  4. 139
- 1-63. What tension, in pounds, must be applied to a tape tension scale if you are required to apply 8 to 10 kilogram tension to an unsupported tape?
1. 8.6 to 10.0
  2. 11.6 to 15.0
  3. 17.6 to 22.0
  4. 20.6 to 25.0
- 1-64. How many seconds are there in 0.44 minute of an arc?
1. 16.4
  2. 26.4
  3. 36.4
  4. 46.4
- 1-65. How many degrees are there in 1.38 minutes?
1. 0.023
  2. 0.033
  3. 0.038
  4. 0.41
- 1-66. 72.73 grads, converted into degrees, minutes, and seconds, equals
1.  $57^\circ 17' 25''$
  2.  $59^\circ 27' 17''$
  3.  $65^\circ 27' 25''$
  4.  $68^\circ 39' 17''$
- 1-67. Approximately how many degrees are there in 4,300 roils?
1. 242
  2. 245
  3. 250
  4. 255
- 1-68. Convert  $95^\circ\text{F}$  to degrees C.
1.  $35^\circ\text{C}$
  2.  $34^\circ\text{C}$
  3.  $32^\circ\text{C}$
  4.  $30^\circ\text{C}$
- 1-69. It was determined that 435 linear feet of 2-inch by 4-inch lumber are required for formwork. How many board feet of lumber should be ordered for this job?
1. 278
  2. 280
  3. 286
  4. 290

1-70. How many pints are there in 2,564 gallons?

1. 20,012
2. 20,112
3. 20,212
4. 20,512

1-71. How many liters are there in 100,000 U.S. gallons?

1. 368,500
2. 378,500
3. 388,500
4. 398,500

1-72. How many liters are there in 301 kiloliters?

1. 3,010
2. 30,100
3. 301,000
4. 3,010,000

1-73. Convert 135 horsepower to watts.

1. 100,710
2. 110,710
3. 120,610
4. 120,710

1-74. Convert 15.85 feet to the nearest  $\frac{1}{8}$  inch in carpenter's measure.

1. 15 ft 8  $\frac{1}{2}$  in
2. 15 ft 10  $\frac{1}{4}$  in
3. 15 ft 10  $\frac{1}{2}$  in
4. 15 ft 11 in

1-75. Approximately how many cubic yards of concrete are required for a 6-inch layer on a 3.5-acre parking lot?

1. 1,415
2. 2,830
3. 5,650
4. 16,950